



NASA STTR 2006 Phase I Solicitation

T5.01 Advanced Extravehicular Activity (AEVA)

Lead Center: JSC

Center: JSC

Complex missions require innovative approaches for maximizing human productivity and for providing the capability to perform useful work tasks. Requirements include reduction of system hardware weight and volume; increased hardware reliability, durability, operating lifetime, and increased human comfort. Specific areas of interest are as follows:

- **Lightweight Structural and Protective Materials:** proposals are sought for development of lightweight structural and protective materials for use in space suits to provide integral shell structure strength, impact, and puncture protection from shape edges, micrometeoroids and orbital debris, radiation protection, and prevention of abrasion, adhesion, and mitigation from Lunar and Martian dust;
- **Protective Suits for Hazardous Environments:** proposals are sought for development of a protective suit based on EVA technologies and concepts for Homeland Security and hazmat applications including hazardous materials handling and minimizing exposures to chemical and biological agents;
- **Airlocks with minimum gas loss and volume:** proposals are sought for development of both in-space and surface vehicle airlocks that minimize gas loss during depressurization and repressurization operations and also require minimum volume for airlock hatch and EVA crewmembers.
- **Nanomaterials Applications:** proposals are also solicited for development of technologies for Advanced Extravehicular Activity that utilize unique properties of nanomaterials that are not possible with conventional materials with special emphasis on applications using single wall carbon nanotubes; and
- **Direct Energy Conversion and Storage:** proposals are sought on advanced concepts that can provide significant increases in specific energy and energy density (Wh/kg and Wh/L), in operating temperature range, in specific power and power density (W/kg and W/L), and in calendar life while improving or maintaining safety commensurate with in-cabin and exterior applications in crewed vehicles.
- **Space suit mounted monocular displays for use inside a space suit** with a small screen of view similar to that of a mobile computer screen and a binocular display with a panoramic field of view similar to that of immersive VR display systems. The monocular must display text, graphics, imagery and video with multiple windows and overlays as well as support all mission profiles with a multi-function display that enables

situational awareness. The binocular must display wide field imagery with overlays, enable 3D or stereoscopic visualization, and provide vision enhancement as a low light navigational aid when combined with image intensification sensors.

- Dust and abrasion mitigating materials, seals, bearings, techniques, and mechanisms for space suits and EVA equipment are solicited. This includes materials and systems that prevent lunar dust from adhering to the outer layer of the suit or removes the dust prior to entry into an airlock. Seals, bearings, and mechanisms that preclude the migration of dust particles into bearings and the space suit life support system and pressure garment are also sought.